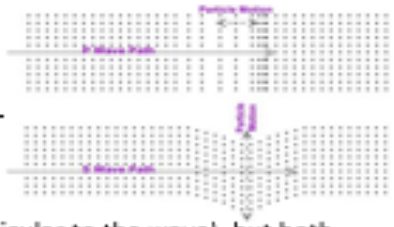
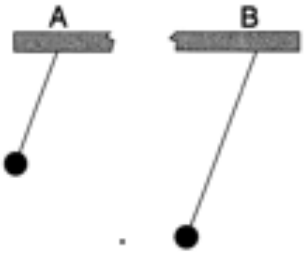
Waves Review Guide Name _____

1. In the image to the right, the particles in the medium vibrate back and forth, but energy is transferred from place to place via the wave



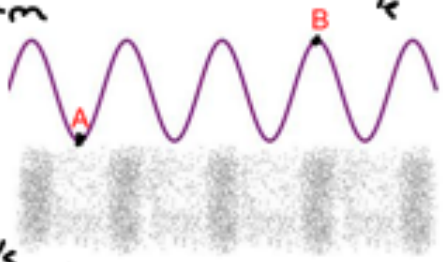
2. The top wave is a longitudinal wave (particles move parallel to the wave) and the bottom wave is a transverse wave (particles move perpendicular to the wave), but both wave are mechanical waves because they require a medium to travel through.

3. Waves transfer energy, they do not transfer mass.



4. Pendulum A to the right will have a shorter period which means, it will have a higher frequency of oscillation. Pendulum B will take longer to make an oscillation because it is longer. If the mass of the bob at the end were increased, the period would not change. If the pendulums were brought to the Moon, their periods would increase

5. It is 30 m between A and B. What is the wavelength of the wave? $30/2.5 = 12$ m

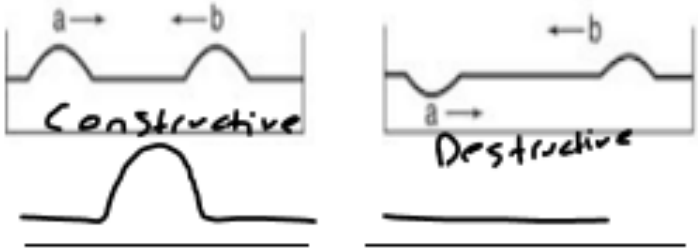


6. It takes 0.035 seconds for one complete oscillation of the wave. What is the frequency of the wave? $1/.035 = 28.6$ Hz The sound wave to the right has the same frequency and wavelength, so what is the speed of sound? $v = (12)(28.6)$ 343.2 m/s

7. If the wavelength of the wave for number 6 were increased, the frequency would decrease and the speed would Not change. For the sound wave, this would result in a higher pitch. Increasing the frequency of the wave would result in a higher pitch and shorter wavelength.

8. Electromagnetic (Light) waves do not require a medium to travel through. Examples would be UV, Radio, and visible (IR, Microwave, X-ray, gamma)

9. As the pulses to the right come together, they will interfere with one another. Label the type of interference and draw what each would look like as they overlap.



10. In the standing wave to the right, the distance between point A and E is 2 m. A complete cycle takes 0.2 seconds.

What is the wavelength? 2m What is the frequency? 5 Hz

What is the speed of the wave? $v = (2)(5) = 10$ m/s

Which points are nodes? A, C, E Antinodes? B + D

11. A string has 5 antinodes housed in a certain length, how many wavelengths is this equal to? $5/2 = 2.5$ λ

12. What is the period of a pendulum that is 1.2 m long?

$T = 2\pi\sqrt{1.2/9.81} = 2.2\,s$

13. What is the **frequency** of a pendulum that is 0.7 m long?

$T = 2\pi\sqrt{.7/9.81} = 1.7\,s \rightarrow f = 1/T = 1/1.7 = .6\,Hz$

14. If a pendulum takes 2.5 seconds to swing in each direction, find the length of the pendulum.

$T = 5\,s$

$\frac{5}{2\pi} = \frac{2\pi\sqrt{L/9.81}}{2\pi}$

$(.79)^2 = \left(\sqrt{L/9.81}\right)^2$

$.63 = L/9.81$

$L = (.63)(9.81) = 6.2\,m$

15. What is the length of a pendulum with a frequency of 0.4 Hz?

$T = 1/f = 1/.4 = 2.5$

$\frac{2.5}{2\pi} = \frac{2\pi\sqrt{L/9.81}}{2\pi}$

$(.4)^2 = \left(\sqrt{L/9.81}\right)^2 \rightarrow .16 = L/9.81$

$L = (.16)(9.81) = 1.6\,m$

16. A transverse wave is observed to be moving along a lengthy rope. Adjacent crests are positioned 2.7 m apart. Exactly six crests are observed to move past a given point along the medium in 6.1 seconds. Determine the wavelength, frequency and speed of these waves.

$\lambda = 2.7\,m$

$f = 6/6.1 = .98\,Hz$

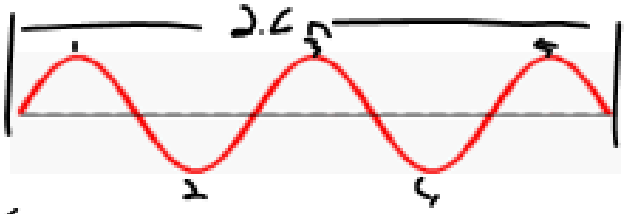
$V = (2.7)(.98) = 2.6\,m/s$

17. The standing wave below is housed in a 2.6 m length of elastic cord at one of its harmonic frequencies. The cord vibrates with the pattern shown below when the frequency is set to 89.7 Hz. Determine the speed of the waves in the elastic cord.

$f = 89.7\,Hz$

$\lambda = 2.6/2.5 = 1.04\,m$

$V = (89.7)(1.04) = 93.3\,m/s$



$5/2 = 2.5$ waves

18. A 212 cm long rope undergoes exactly 72 complete vibrational cycles in 18.4 seconds when vibrating in the third harmonic (in three antinodes). Determine the speed of the waves in the rope.

$f = 3/2 = 1.5/18.4 = 3.9\,Hz$

$212/1.5 = 141.3\,cm = \lambda$

$\lambda = 141.3\,cm$

$V = (3.9)(141.3) = 551.2\,cm/s$